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Success Story

DR. JOHN MAGUIRE RECEIVES 2001 BRIMACOMBE AWARD FOR RESEARCH EXCELLENCE

The J. Keith Brimacombe Award recognizes outstanding researchers who work in the field of intelligent processing and materials manufacturing for at least 10 years, and have made clear, recognized, and respected contributions to these areas. Dr. John F. Maguire's (pictured on right in both photos) research can solve several industry and scientific problems in nanomaterials processing research, determining the characteristics of metals and arranging grains properly in superconductors.

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Accomplishment

Dr. Maguire, a Materials and Manufacturing Directorate scientist, received the Brimacombe Award during the third Intelligent Processing and Manufacturing of Materials (IPMM) Conference in Vancouver, British Columbia, Canada. The IPMM cited Dr. Maguire, a research leader for the directorate's Manufacturing Technology Division, Materials Process Design Branch, for his contribution to soft and interfacial matter research, and development of material processing and new techniques in computer simulation and molecular dynamics.

Background

Advanced future material applications, such as high-power radars, ultra-lightweight airframe structures, and large-adaptive space-based optics, require the development of new materials whose characteristics far exceed the capabilities of current materials. Discoveries in the area of soft, interfacial, and granular materials could provide new nano-matter with engineered properties and controlled structures.

Dr. Maguire performed research in electronic prototyping that applies new kinds of computation techniques to address contemporary problems in the simulation of matter. Specifically, he addressed the way crystals and grain structures pack together in space and time to determine the behavior and properties of materials.

An electronic prototyping computer application, developed by Dr. Maguire and his colleagues, allows the user to visualize how each of hundreds of thousands of grains position themselves according to the laws of physics. This computer application predicts the properties of this virtual material.

The application enables very rapid calculation of the forces between the particles and quickly determines where in space and when in time a pair of hard particles will collide. This is done hundreds of millions of times in the computer using algorithms based on artificial neural nets. In this approach, the computer learns the collision dynamics and trajectories of a relatively small number of "exemplars," and uses the particulate artificial neural net dynamics algorithm to rapidly interpolate for unknown trajectories.

Materials and Manufacturing
Awards and Recognition

Additional information

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